My work and LED activities at DTU Fotonik

Chakrabarti, Maumita

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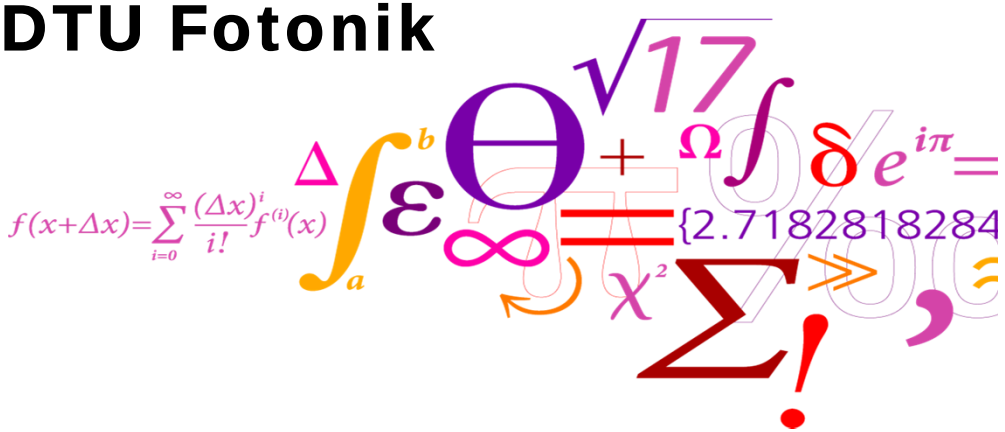
Maumita Chakrabarti

PhD student (01-01-13 – 31-12-15)

DTU Fotonik



DTU Fotonik
Department of Photonics Engineering

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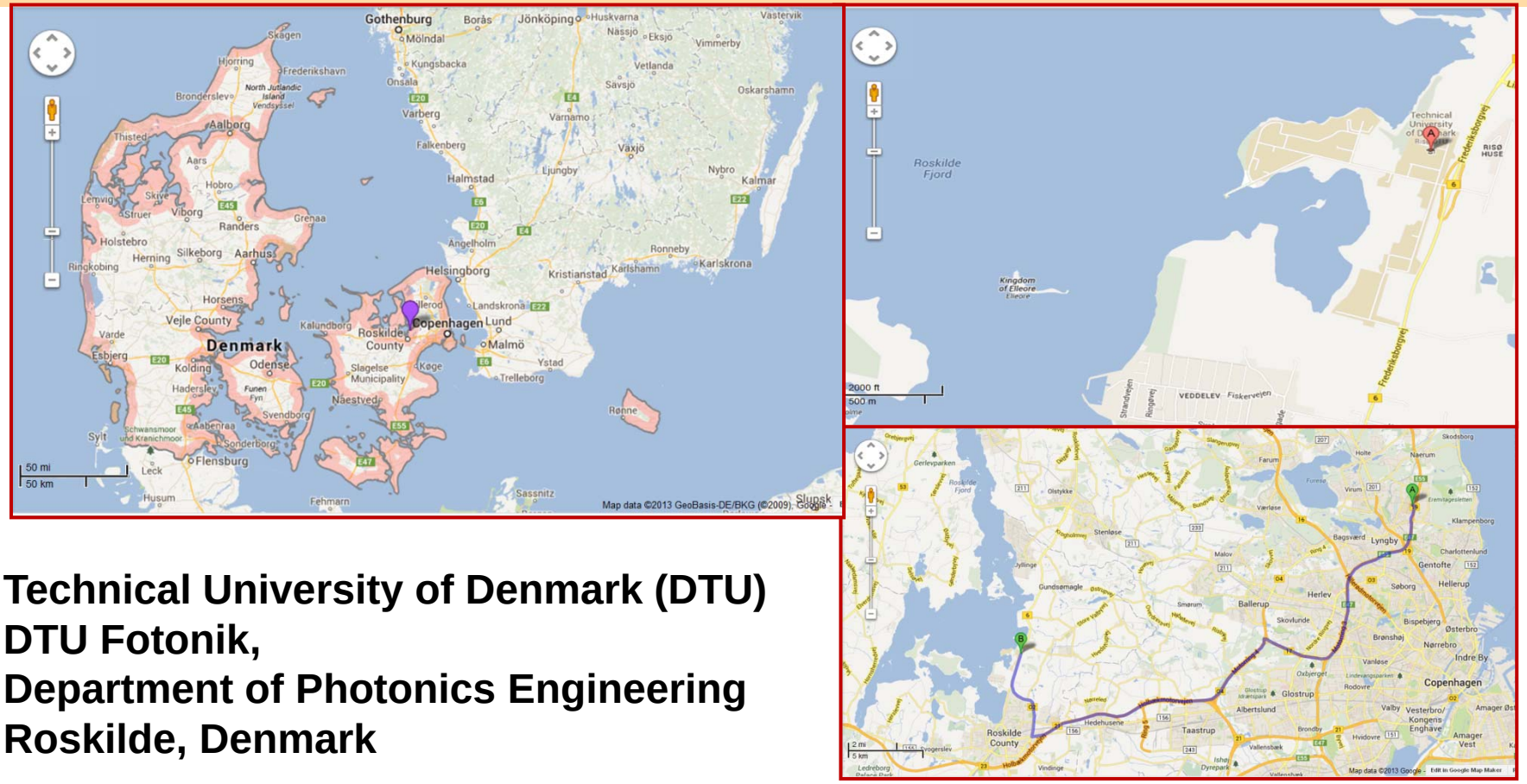
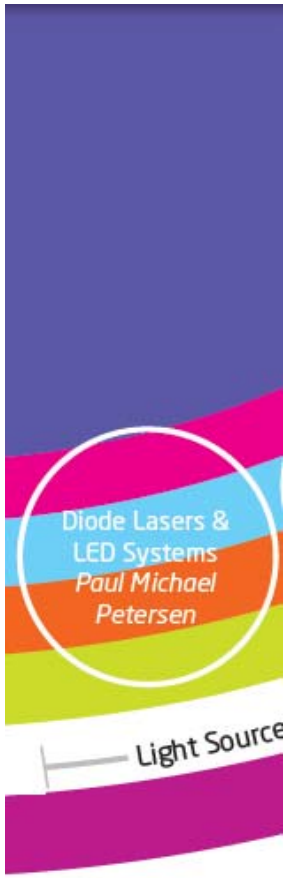


Technical University of Denmark (DTU)
DTU Fotonik,
Department of Photonics Engineering
Roskilde, Denmark

DTU Fotonik

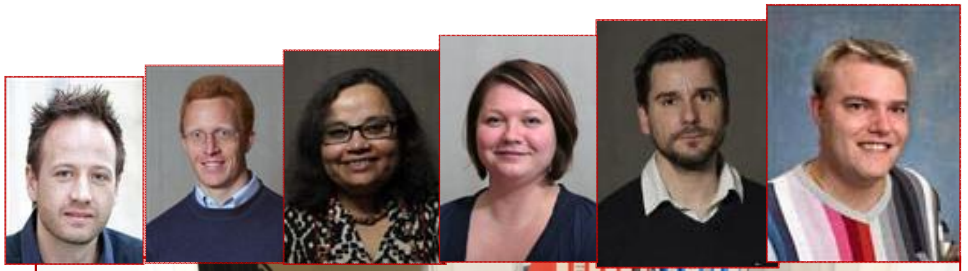
- Educational and research institute at the DTU
  - Telecommunication and optical technologies
- Campus at Lyngby and Risø, Roskilde
- 200 employees incl. 60 Ph.D.-students (in 2012)
- 25 different nationalities (in 2012)
- > 50 graduate courses offered (in 2012)
- 80 M.Sc. candidates and 15 Ph.D students per year (not updated)
- Access to world class clean room process facilities, DANCHIP (>1000 m^2)

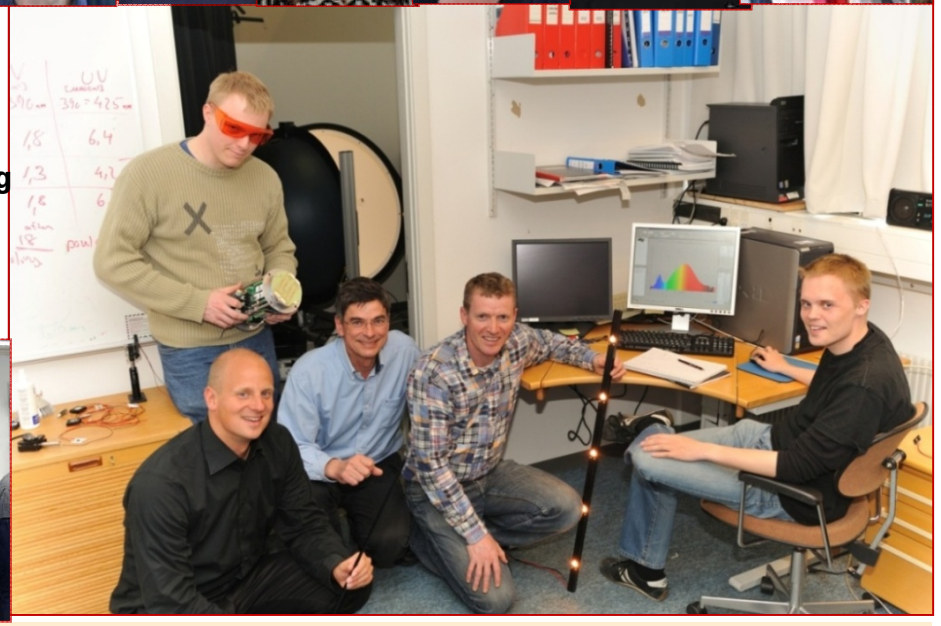
LED team



Risø campus:

Paul Michael Petersen
Carsten Dam-Hansen
Dennis Corell
Anders Thorseth
Peter Behrensdorff Poulsen
Søren Hansen
Peter Jensen
Jesper Wolff
Sune Thorsteinsson
Maria Louisa Rosenberg Welling
Jakob Munkgaard Andersen
Thøger Kari Jensen
Maumita Chakrabarti





LED activities

LED – the future light source, energy efficient, long life, high light quality, compact, robust than incandescent lamps

Need for:

Research and development, Master and Ph.d – education, Education of designers, Lighting industry, Product characterisation and Information for consumers

- **Research projects on LEDs, materials and characterisation**
- **Master course on LED and PV technology**
- **Annual Industrial LED course and course for high school students**
- **Application specific R&D projects in collaboration with Danish companies with a focus on energy savings and light quality**
- **Commercial development and characterisation of LED systems**

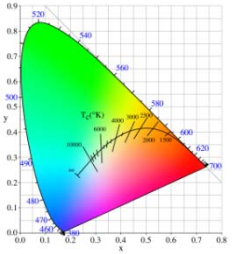
LED competences

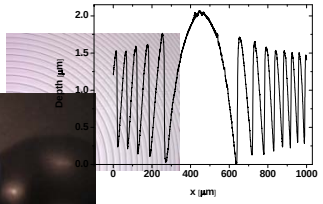
LED systems

Test and characterisation

LEDs

Spectral design

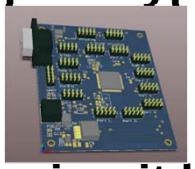




Optical design, modeling, and test fabrication

Thermal modeling and test

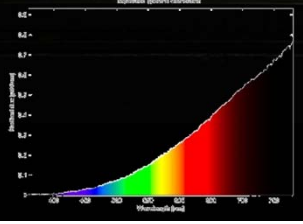
Al. circuit board design and reflow soldering

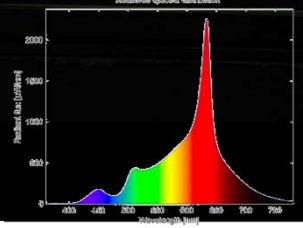


Control electronics, design and prototyping

New LED system for display cases

- developed and installed, April 2011 in the royal treasury at Rosenborg Castle



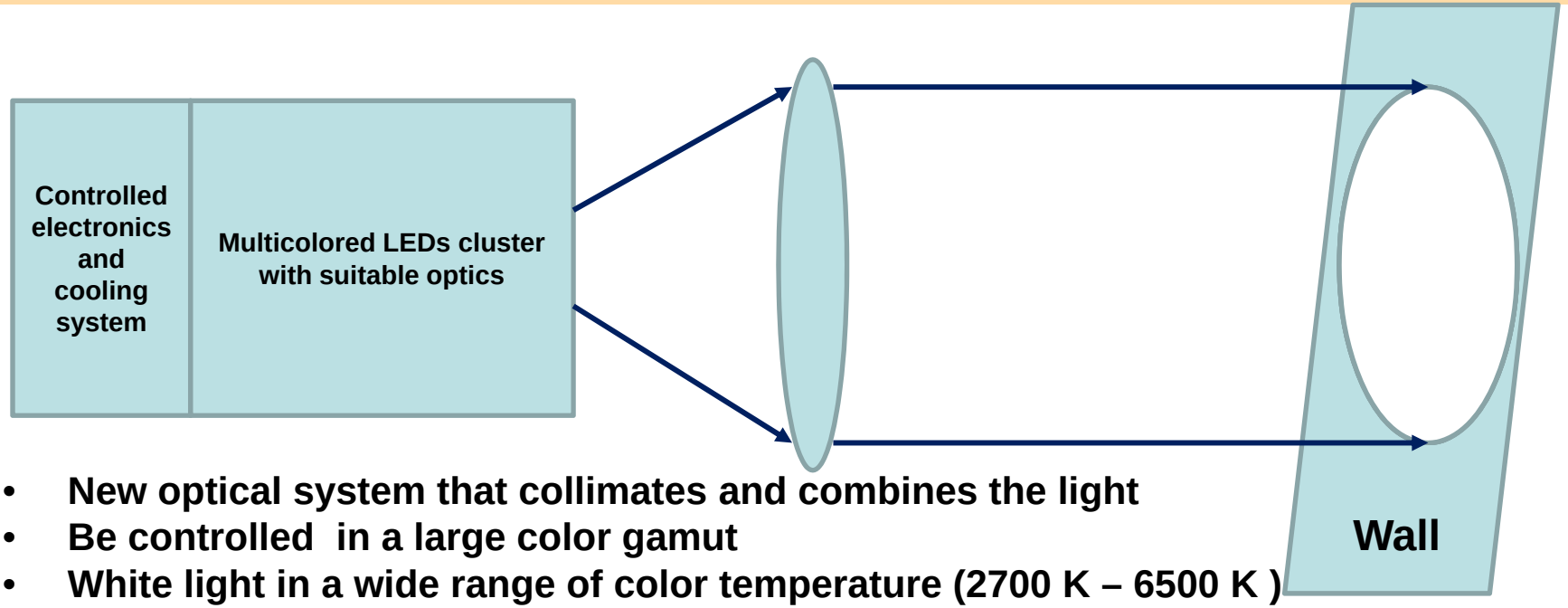


Patent application on the LED optical system

Industry collaboration: film about the project:

High quality replacement of 5 W incandescent lamps
CCT = 2200 K, CRI > 93
> 80 % energy reduction
heat problem eliminated
> 20 x longer lifetime

Multi color high power LED engine



- New optical system that collimates and combines the light
- Be controlled in a large color gamut
- White light in a wide range of color temperature (2700 K – 6500 K) with high color rendering
- Color rendering index higher than 95
- High output ~ 10000-20000 lm
- Uniform and homogeneous output throughout the spot size
- Application: stage lighting and it could replace the conventional lamps of ~ 1000W

LED education

Annual conference on LED technology and lighting from 2007 till date

- Several participants from companies, municipalities and institutions
- Companies in exhibition

Industrial LED workshop

9th of February 2011

- 20 participants (max 20)
- Lectures combined with theorectical and experimental exercises
- Build and characterise participant's own LED system

Cooperation with designers

LED Waterlilly lamp, 2006
Design : Jesper Olsen

- **White LEDs for functional lighting**
- **RGB LEDs for decorative illumination of the rim**

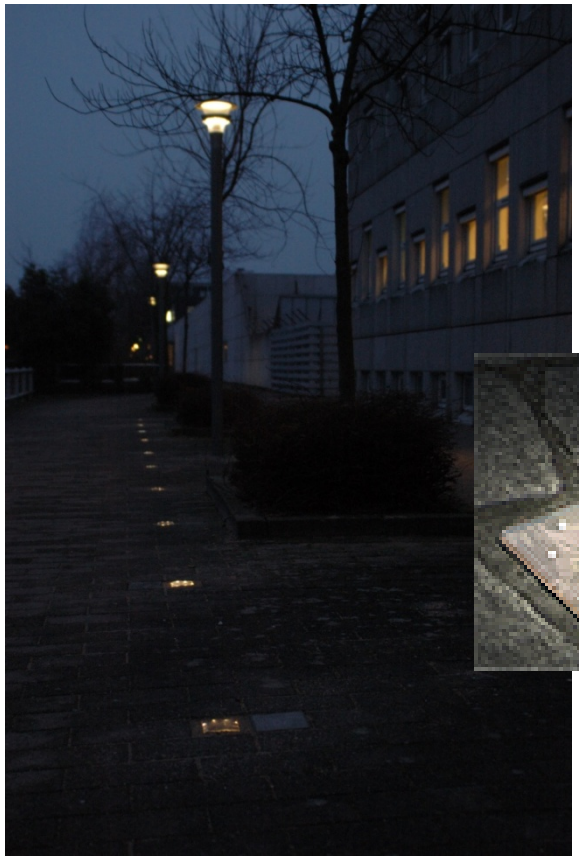
archetype
design Goodmorning Technology

2011

- **Replacement lamp (E27 socket)**
- **Concealed is a LED light source**
- **LED 12 W, 806 lumen,**
- **warm white 2700 K**

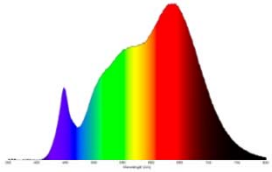
Cooperation with designers

Demonstration projects in Albertslund kommune



Intelligent stone with solar powered LED illumination

Facilities for light measurements



Near field goniometer with

- **luminance camera**
- **spectrometer**
- **photometer**

for intensity and color distribution

Acknowledgement

I would like to thank my supervisor Carsten Dam-Hansen, DTU Fotonik for his kind support and help and also I would like to thank my LED team members for their kind co-operation .
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Thank you for your kind attention